Chemistry

Golden foam blankets nuclear radiation

Chemists and business executives have long known there's gold in chemical polymers, but until recently that has only been figuratively true. Now John Fackler of Texas A&M University in College Station has invented a polymer foam that holds molecules of gold suspended in it. The remarkable yellow metal's ability to absorb and scatter atomic particles could make the foam useful as a lightweight shield in areas with high nuclear radiation, Fackler says.

Gold is held in the foam by binding to the carbon atoms in chains of polyethylene. It wasn't easy to get the gold suspended in the polymer, but Fackler had very limited choices in what metal to use because gold is one of the few nonradioactive metals heavy enough to scatter nuclear radiation, he says. Platinum, mercury, thallium and bismuth can also do the job, but each has problems: Platinum oxidizes too easily, mercury is toxic, thallium is carcinogenic and bismuth won't bind readily to the carbon in polyethylene, Fackler says.

The foam, white and about the density of Styrofoam, can also be shaped into mirrors or lenses for particle accelerators or fabricated into lightweight protective clothing for people working in radioactive environments, Fackler says. Gold's excellent electrical conductivity also makes the polymer potentially useful as lightweight battery electrodes or electrical heating elements for de-icing aircraft wings, he adds.

Biomolecules from a quantum viewpoint

Chemists have learned a great deal about the chemical dynamics of biological molecules by creating computer simulations of the molecules' structure and movement. These computer simulations use principles of classical physics, however, and some scientists worry that quantum mechanical effects may force a change in theories about how the molecules actually work.

A team of scientists from two universities has constructed the first quantum mechanical simulation of such a biomolecule and found important differences between the classical view of the molecule and the quantum mechanical view, they write in the Aug. 25 NATURE. J. Andrew McCammon and his colleagues at the University of Houston and Peter Wolynes at the University of Illinois in Urbana-Champaign simulated the molecular motions of atomic groups in the molecule ferrocytochrome C using quantum dynamic principles and found "significant differences" in how the stretching of chemical bonds and the oscillation of chemical groups was modeled.

Ferrocytochrome C is one of the molecules that pass electrons down an energy chain to make oxygen respiration possible. The differences in how the molecule appears when viewed through the lens of quantum mechanics will directly influence the expected rates of electron transfer in the process. The differences could change our view of how oxygen respiration evolved and have an impact on researchers who want to design new proteins with better electron transfer properties, McCammon says.

"This [simulation] could be used in research in biological, materials and energy sciences," McCammon says. "For instance, people think about using electron transfer proteins in solar energy devices and it might have some application there."

And the speed of a bond breaking is . . .

Last December, to great fanfare, Ahmed Zewail of the California Institute of Technology in Pasadena announced that he and his colleagues had devised a way to clock the previously unmeasurable speed of the disintegration of a chemical bond: ICN to I + CN (SN: 12/12/87, p.372). In the Sept. 2 SCIENCE, Zewail reveals the actual speed of the reaction: 205 femtoseconds (10^{-15} seconds).

Earth Sciences

Golf courses may cool the desert

Scientists and urbanites are quite familiar with the "heat island" effect, which makes cities warmer than surrounding lawn-marbled suburbs. Now on the flip side, climate researchers think they have identified a desert locale where urban development has helped cool a city — what they term a "cool island" effect.

Since the early 1970s, Palm Springs, Calif., has cooled off several degrees relative to nearby towns such as Redlands, apparently because golf course construction has turned the town into a veritable oasis, report Robert Balling and Nina Lolk from Arizona State University in Tempe.

Golf courses and other vegetated urban plots such as cemeteries and parks are known to keep city temperatures lower through evaporation. When radiation from the sun hits a street or building, most of the incoming energy is transformed into heat. However, if the rays strike an irrigated area, part of the energy evaporates water from plants and soil, leaving less energy to create heat, says Balling.

Although many possible reasons could explain why Palm Springs is growing cooler than its neighbors, Balling says the most reasonable explanation is the growing area of turf within the city. At least two-thirds of the approximately 75 golf courses in town were constructed within the last 15 years, which is when the cooling trend began, he says.

Microclimatic studies on golf courses in Phoenix have verified this effect on a small scale. "When you walk out on a golf course, you can go from an environment that is 108°F or 110°F, and if you take air temperatures right over the golf course on a calm day, it's often as much as 8 or 9 degrees colder than surrounding areas that are not irrigated," says Balling, who has spent several years studying how expanding desert cities such as Phoenix and Tucson are warming with respect to the surrounding deserts.

Huge dinosaur pelvis found in Colorado

Dead for 140 million years, a specimen of the colossal dinosaur "Supersaurus" is slowly taking shape as researchers uncover more pieces of this giant — one of the longest dinosaurs ever found. Paleontologists last month discovered a pelvic section that stretches more than 6 feet in length and is believed to belong to Supersaurus. Scientists from Brigham Young University in Provo, Utah, unearthed the fossil at the Dry Mesa Quarry near Delta, Colo., the site that has yielded all other parts of this dinosaur.

Supersaurus is an unofficial name, describing a mixed bag of enormous skeletal parts all thought to be part of a single type of sauropod dinosaur from the Diplodocidae family. Scientists have estimated Supersaurus may have spanned 100 to 120 feet, says John S. McIntosh from Wesleyan University in Middletown, Conn., an authority on sauropods who visited the quarry to examine the newly found fossil. Among paleontologists, there is debate over whether Supersaurus represents an entirely new genus in the Diplodocidae family or a larger species of the genus *Diplodocus*. With its long, slender neck and even longer, whip-like tail, *Diplodocus* looked something like a plant-munching cantilever bridge.

The recent Dry Mesa find consists of a pelvic bone attached to the sacrum, which are several vertebrae fused together to withstand the tremendous forces borne by this part of the body. Other oversized parts discovered in the quarry are a shoulder blade, a neck vertebra, some tail vertebrae and another pelvic bone. While all have been lumped together under the name of Supersaurus, McIntosh says, "it is not definite that all of these bones are from the same animal or even the same kind of animal." He adds, though, that "there is a better than 50/50 chance Supersaurus is valid."